

# HELIENE

## PHOTOVOLTAIC MODULES

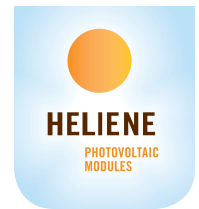
### HELIENE INC. INSTALLATION MANUAL

**HELIENE 60<sup>P</sup>**

**HELIENE 60<sup>M</sup>**

**HELIENE 72<sup>P</sup>**

**HELIENE 72<sup>M</sup>**



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## TECHNICAL CHARACTERISTICS

HELIENE INTEGRATES ONLY WORLD CLASS, PROVEN COMPONENTS INTO ITS PRODUCTS. HELIENE SOLAR MODULES INCLUDE THE LATEST TECHNOLOGY OF MONO-CRYSTALLINE AND MULTI-CRYSTALLINE 6 INCH (156MM) SOLAR CELLS, DESIGNED AND MANUFACTURED BY LEADING EUROPEAN, ASIAN AND NORTH AMERICAN SUPPLIERS. THE ABSORPTION SURFACE AND INNOVATIVE DESIGN PROVIDE A WORLD CLASS POWER OUTPUT AND AN AESTHETIC LOOK.

EACH MODULE CONSISTS OF EITHER 60 OR 72 HIGH-QUALITY CELLS IN SERIAL CONFIGURATION TO ACHIEVE OPTIMAL POWER AND VOLTAGE FOR PHOTOVOLTAIC SYSTEMS, CAN BE EITHER CONNECTED TO THE GRID OR NOT.

PLEASE READ CAREFULLY ALL OF THE INSTRUCTIONS AND RECOMMENDATIONS IN THIS MANUAL, BEFORE DESIGNING, ASSEMBLING, OPERATING, OR MAINTAINING PHOTOVOLTAIC MODULES 60P, 60M, 72P OR 72M.

HELIOS ENERGY EUROPE, S.L. HELIENE INC., AND HELIOS USA LLC DISCLAIM ANY LIABILITY FOR BREAKAGE, DETERIORATION OR THE LOSS OF PERFORMANCE OF ANY OF ITS MODULES RESULTING FROM THE INCORRECT USE, MAINTENANCE AND/OR INSTALLATION.

THE JUNCTION BOX HAS A LEVEL OF PROTECTION OF IP65 AGAINST INFILTRATION OF DUST AND/OR WATER. THIS JUNCTION BOX HOUSES THE CONNECTION OF THE METALLIC CELL CONNECTION STRINGS OF THE MODULE TO THE CABLES (POSITIVE AND NEGATIVE). THE BYPASS DIODES ARE CONNECTED INSIDE, ENSURING THE THERMAL STABILITY OF THE CELLS IN CASE OF SHADING DURING THE HOURS OF IRRADIATION.

TWO ISOLATED COPPER CABLES, 4MM<sup>2</sup> AND 1.2 M LONG EMERGE FROM THE JUNCTION BOX. EACH CABLE IS CONNECTED AT ITS END WITH MULTI-CONTACT PLUGS (MC4) OR COMPATIBLE HIGH QUALITY EQUIVALENT OF MC4, ONE MALE, AND ONE FEMALE, WHICH FACILITATE THE CONNECTION OF THE MODULES.

IN ORDER TO PROTECT THE MODULE AGAINST BACK-FEED, FAST ACTING FUSES OF A MAXIMUM OF 15 AMPS, AND A MINIMUM OF 10 AMPS ARE TO BE USED WHEN CONNECTING IN SERIES.

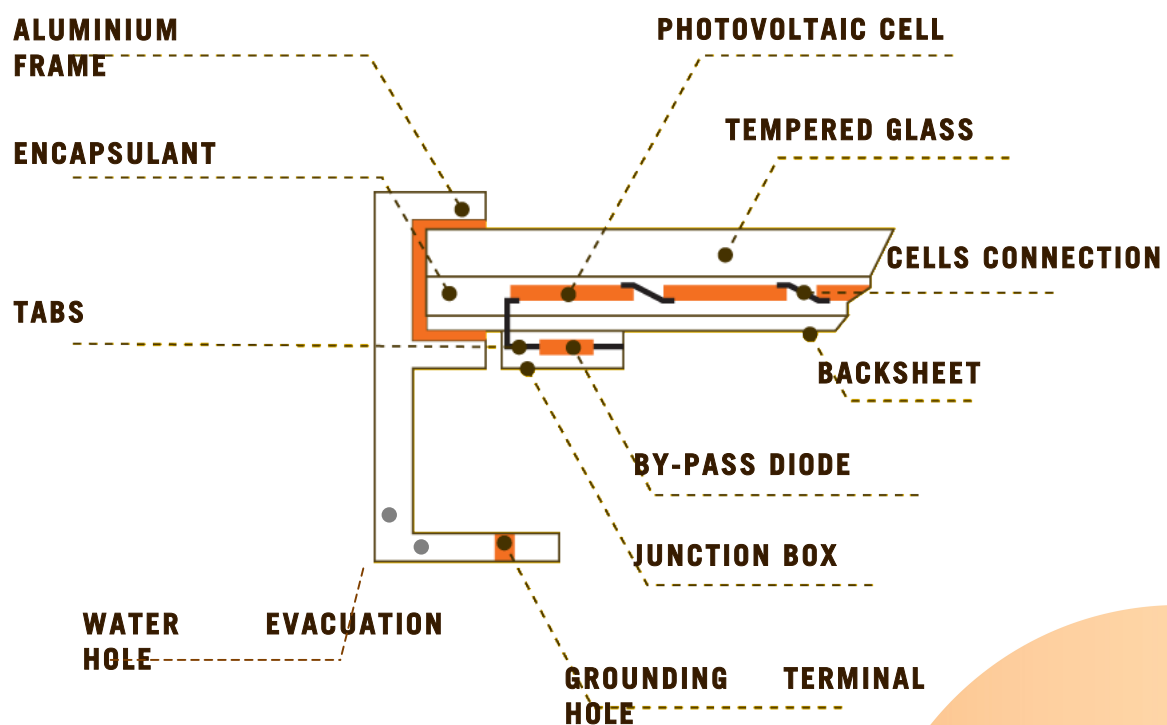
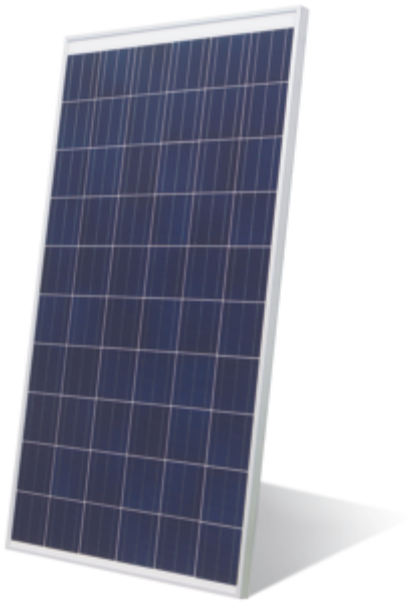


FIGURE 1. CROSS-SECTION OF A MODULE IDENTIFYING DIFFERENT COMPONENTS.

# HELIENE 60<sup>P</sup>



Mechanical Data	
Dimensions (L x W x D)	1680 x 990 x 40 mm
Weight	19 kg
Output Cables	>1.0m (symmetrical), MC4 type connectors
Junction Box	IP-65 rated with bypass diodes
Frame	Double webbed 5 micron anodized aluminum
Front Glass	Textured high-transmission PV solar glass
Solar Cells	60 Poly-crystalline cells (156 x 156 mm)

Certifications	
UL Listed	ULC/ORD-C1703-1 , UL1703
IEC Listed	IEC 61215, IEC 61730

Operating Conditions	
Temperature	- 40 C to + 85 C
Max Load	5400 Pa
Static Load	2400 Pa
Impact Resistance	Hailstone Impact (25mm @ 23m/s)

Electrical Data (STC)					
Max Rated Power	P <sub>mp</sub> (W)	250	245	240	235
Voltage @ Max Power	V <sub>mp</sub> (V)	30.70	30.43	30.35	29.9
Current @ Max Power	I <sub>mp</sub> (A)	8.14	8.05	7.91	7.86
Open Circuit Voltage	V <sub>oc</sub> (V)	37.8	37.65	37.55	37.0
Short Circuit Current	I <sub>sc</sub> (A)	8.65	8.6	8.55	8.48
Module Efficiency *	Eff (%)	15.3	15.0	14.7	14.4
Output Tolerance	[- 0 , + 4.99] Wp				

STC - Standard Test Conditions: Irradiation 1000 W/m² - Air mass AM 1.5 - Cell temperature 25 °C  
 \* Calculated using maximum power based on full positive output tolerance [-0 , +4.99] Wp

System Electrical Parameters		
System Voltage (UL/IEC)	600 V / 1000 V	
P <sub>mp</sub> Temperature Coefficient	(%/C)	-0.43
V <sub>oc</sub> Temperature Coefficient	(%/C)	-0.32
I <sub>sc</sub> Temperature Coefficient	(%/C)	+0.07
Serial Fuse Rating	15 A	
Bypass Diode Rating	15 A	

THE MAXIMUM POWER VALUE, OPEN CIRCUIT VOLTAGE AND SHORT CIRCUIT CURRENT OF ANY INDIVIDUAL MODULE WILL BE ±3% OF THESE VALUES. SPECIFICATIONS ARE SUBJECT TO CHANGE.

## HELIENE 60<sup>M</sup>



Mechanical Data	
Dimensions (L x W x D)	1680 x 990 x 40 mm
Weight	19 kg
Output Cables	>1.0m (symmetrical), MC4 type connectors
Junction Box	IP-65 rated with bypass diodes
Frame	Double webbed 5 micron anodized aluminum
Front Glass	Textured high-transmission PV solar glass
Solar Cells	60 Mono-crystalline cells (156 x 156 mm)

Certifications	
UL Listed	ULC/ORD-C1703-1, UL1703
IEC Listed	IEC 61215, IEC 61730

Operating Conditions	
Temperature	- 40 C to + 85 C
Max Load	5400 Pa
Static Load	2400 Pa
Impact Resistance	Hailstone Impact (25mm @ 23m/s)

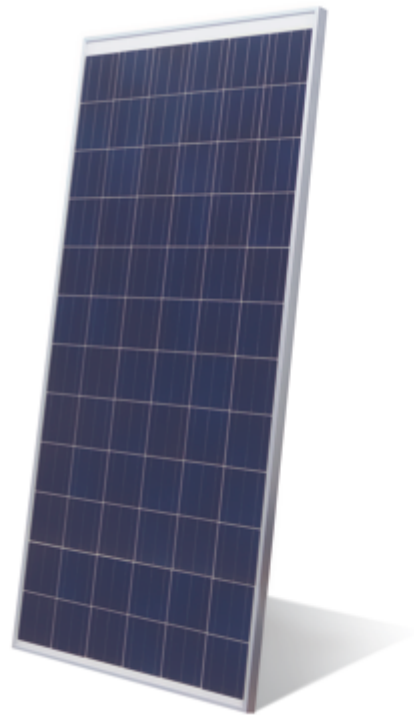
Electrical Data (STC)					
Max Rated Power	P <sub>mp</sub> (W)	260	255	250	245
Voltage @ Max Power	V <sub>mp</sub> (V)	30.84	30.65	30.30	30.03
Current @ Max Power	I <sub>mp</sub> (A)	8.43	8.32	8.22	8.18
Open Circuit Voltage	V <sub>oc</sub> (V)	37.73	37.5	37.40	37.26
Short Circuit Current	I <sub>sc</sub> (A)	8.9	8.88	8.72	8.71
Module Efficiency *	Eff (%)	15.9	15.6	15.3	15.0
Output Tolerance	[- 0, + 4.99] Wp				

STC - Standard Test Conditions: Irradiation 1000 W/m<sup>2</sup> - Air mass AM 1.5 - Cell temperature 25 °C  
 \* Calculated using maximum power based on full positive output tolerance [-0, +4.99] Wp

System Electrical Parameters		
System Voltage (UL/IEC)	600 V / 1000 V	
P <sub>mp</sub> Temperature Coefficient	(%/C)	-0.44
V <sub>mp</sub> Temperature Coefficient	(%/C)	-0.34
I <sub>mp</sub> Temperature Coefficient	(%/C)	+0.07
Serial Fuse Rating	15 A	
Bypass Diode Rating	15 A	

THE MAXIMUM POWER VALUE, OPEN CIRCUIT VOLTAGE AND SHORT CIRCUIT CURRENT OF ANY INDIVIDUAL MODULE WILL BE  $\pm 3\%$  OF THESE VALUES. SPECIFICATIONS ARE SUBJECT TO CHANGE.

# HELIENE 72<sup>P</sup>



Mechanical Data	
Dimensions (L x W x D)	1984 x 984 x 40 mm
Weight	26 kg
Output Cables	>1.0m (symmetrical), MC4 type connectors
Junction Box	IP-65 rated with bypass diodes
Frame	Double webbed 5 micron anodized aluminum
Front Glass	Textured high-transmission PV solar glass
Solar Cells	72 Poly-crystalline cells (156 x 156 mm)

Certifications	
UL Listed	ULC/ORD-C1703-1 , UL1703
IEC Listed	IEC 61215, IEC 61730

Operating Conditions	
Temperature	- 40 C to + 85 C
Max Load	5400 Pa
Static Load	2400 Pa
Impact Resistance	Hailstone Impact (25mm @ 23m/s)

Electrical Data (STC)					
Max Rated Power	P <sub>mp</sub> (W)	300	295	290	285
Voltage @ Max Power	V <sub>mpp</sub> (V)	36.84	36.52	36.34	36.05
Current @ Max Power	I <sub>mp</sub> (A)	8.14	8.05	7.98	7.91
Open Circuit Voltage	V <sub>oc</sub> (V)	45.36	45.2	44.55	44.2
Short Circuit Current	I <sub>sc</sub> (A)	8.65	8.6	8.57	8.55
Module Efficiency *	Eff (%)	15.6	15.4	15.1	14.9
Output Tolerance	[- 0 , + 4.99] Wp				

STC - Standard Test Conditions: Irradiation 1000 W/m² - Air mass AM 1.5 - Cell temperature 25 °C  
 \*Calculated using maximum power based on full positive output tolerance [-0 , +4.99] Wp

System Electrical Parameters		
System Voltage (UL/IEC)	600 V / 1000 V	
P <sub>mp</sub> Temperature Coefficient	(%/C)	-0.43
V <sub>oc</sub> Temperature Coefficient	(%/C)	-0.32
I <sub>sc</sub> Temperature Coefficient	(%/C)	+0.07
Serial Fuse Rating	15 A	
Bypass Diode Rating	15 A	

THE MAXIMUM POWER VALUE, OPEN CIRCUIT VOLTAGE AND SHORT CIRCUIT CURRENT OF ANY INDIVIDUAL MODULE WILL BE ±4% OF THESE VALUES. SPECIFICATIONS ARE SUBJECT TO CHANGE.

## HELIENE 72<sup>M</sup>



Mechanical Data	
Dimensions (L x W x D)	1984 x 984 x 40 mm
Weight	26 kg
Output Cables	>1.0m (symmetrical), MC4 type connectors
Junction Box	IP-65 rated with bypass diodes
Frame	Double webbed 5 micron anodized aluminum
Front Glass	Textured high-transmission PV solar glass
Solar Cells	72 Mono-crystalline cells (156 x 156 mm)
Certifications	
UL Listed	ULC/ORD-C1703-1 , UL1703
IEC Listed	IEC 61215, IEC 61730
Operating Conditions	
Temperature	- 40 C to + 85 C
Max Load	5400 Pa
Static Load	2400 Pa
Impact Resistance	Hailstone Impact (25mm @ 23m/s)

Electrical Data (STC)					
Max Rated Power	P <sub>max</sub> (W)	310	305	300	295
Voltage @ Max Power	V <sub>mp</sub> (V)	36.77	36.65	36.55	36.4
Current @ Max Power	I <sub>mp</sub> (A)	8.43	8.32	8.2	8.1
Open Circuit Voltage	V <sub>oc</sub> (V)	45.4	45.1	44.96	44.77
Short Circuit Current	I <sub>sc</sub> (A)	8.9	8.86	8.77	8.67
Module Efficiency *	Eff (%)	16.1	15.9	15.6	15.4
Output Tolerance	[- 0 , + 4.99] Wp				

STC - Standard Test Conditions: Irradiation 1000 W/m<sup>2</sup> - Air mass AM 1.5 - Cell temperature 25 °C  
 \*Calculated using maximum power based on full positive output tolerance [-0 , +4.99] Wp

System Electrical Parameters		
System Voltage (UL/IEC)	600 V / 1000 V	
P <sub>mp</sub> Temperature Coefficient	(%/C)	-0.44
V <sub>oc</sub> Temperature Coefficient	(%/C)	-0.34
I <sub>sc</sub> Temperature Coefficient	(%/C)	+0.07
Serial Fuse Rating	15 A	
Bypass Diode Rating	15 A	

THE MAXIMUM POWER VALUE, OPEN CIRCUIT VOLTAGE AND SHORT CIRCUIT CURRENT OF ANY INDIVIDUAL MODULE WILL BE  $\pm 4\%$  OF THESE VALUES. SPECIFICATIONS ARE SUBJECT TO CHANGE.

## ELECTRICAL VALUES

IN ACTUAL CONDITIONS, THE VARIATION OF THE OPERATION PARAMETERS FOR THE CELLS WILL BE RELATED TO THE VARIATION OF SUN LIGHT (RADIATION) RECEIVED AND THE ACTUAL WEATHER CONDITIONS (TEMPERATURE). THESE PARAMETERS SHOW THE INDICATED VALUES IN THE PREVIOUS CHARTS.

THE VARIATIONS OF THE WORKING POINT OF THE MODEL ACCORDING TO DIFFERENT OPERATION PARAMETERS ARE SHOWN IN THE GRAPHS ON THE NEXT PAGE.

## 60P / 60M CURRENT, VOLTAGE CURVES VARIATION DUE TO SOLAR RADIANCE & TEMPERATURE

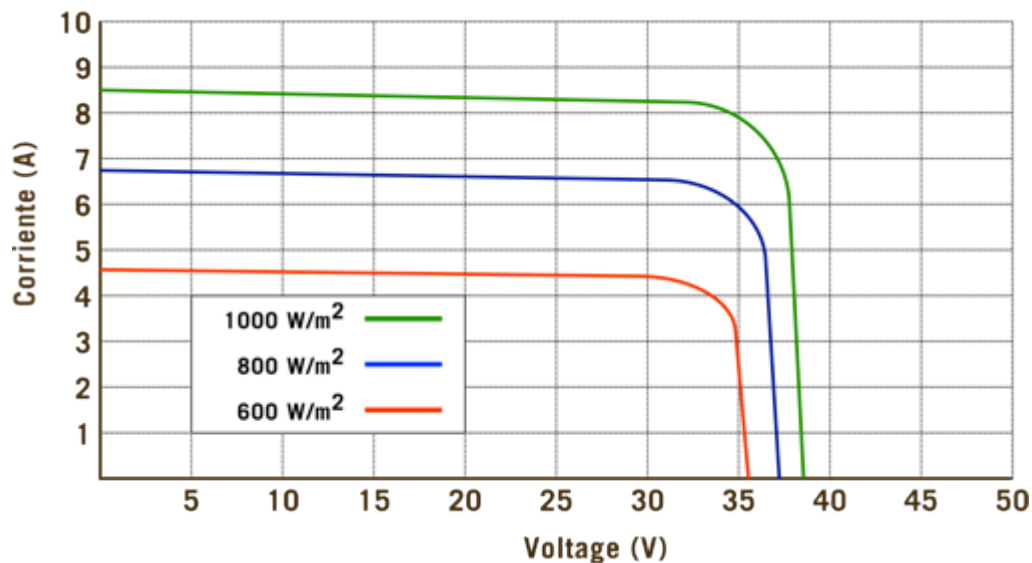


FIGURE 2. VARIATION OF THE CURVE CURRENT / VOLTAGE ACCORDING TO THE INCIDENTAL SOLAR RADIANCE TO A CELL TEMPERATURE OF 25 °C

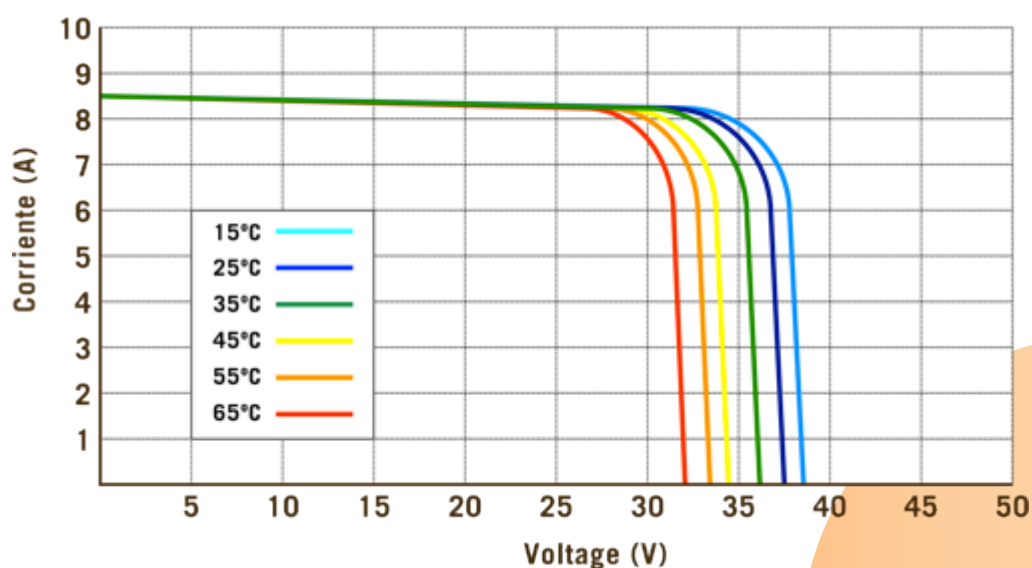


FIGURE 3. VARIATION OF THE CURVE OF CURRENT / VOLTAGE ACCORDING TO THE TEMPERATURE OF THE CELL.



## 72P / 72M CURRENT, VOLTAGE CURVES VARIATION DUE TO SOLAR RADIANCE & TEMPERATURE

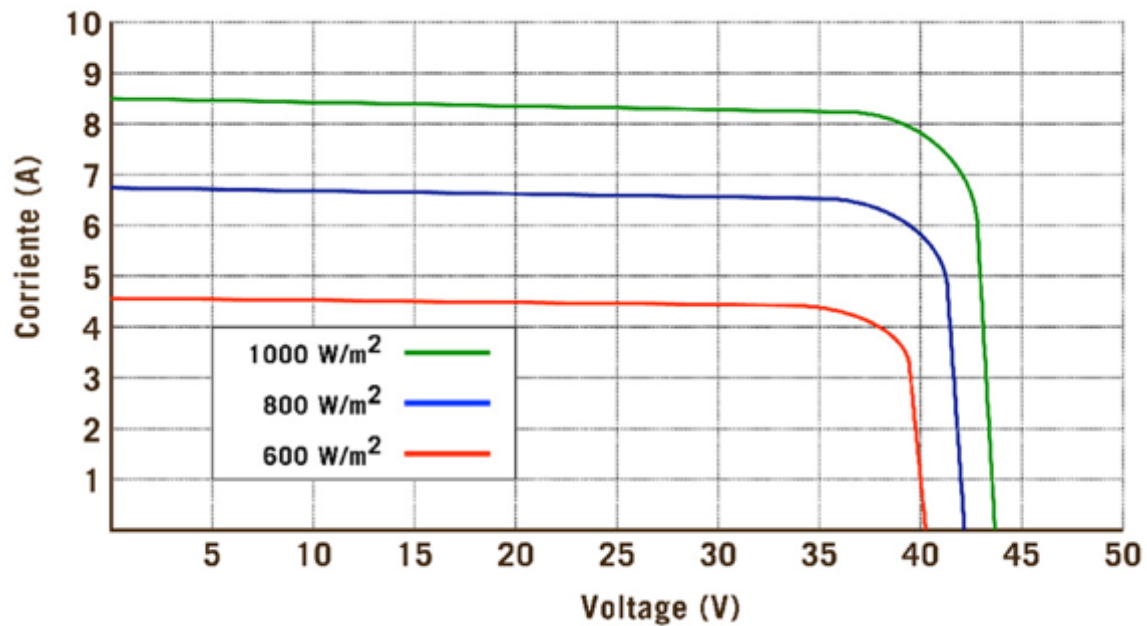


FIGURE 2. VARIATION OF THE CURVE CURRENT / VOLTAGE ACCORDING TO THE INCIDENTAL SOLAR RADIANCE TO A CELL TEMPERATURE OF 25 °C

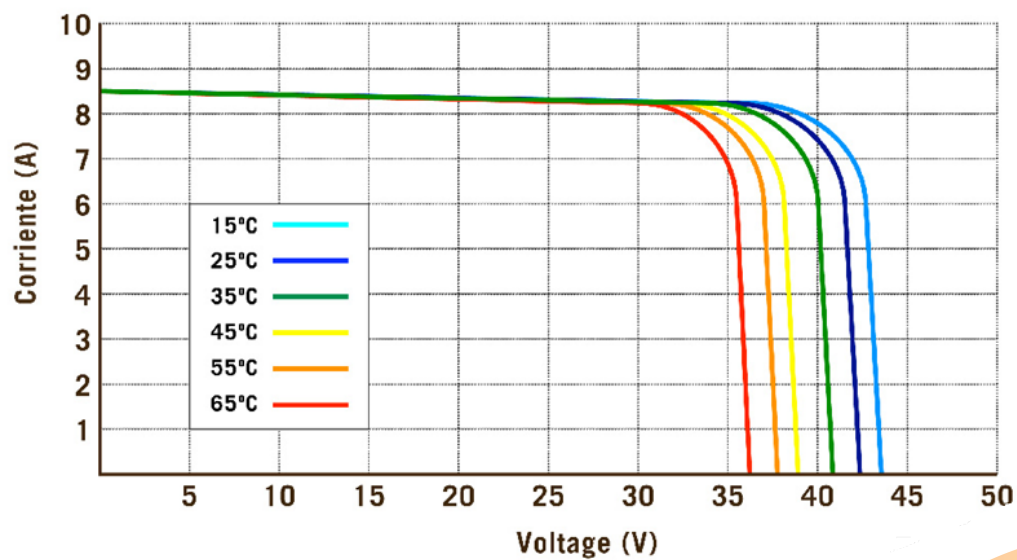


FIGURE 3. VARIATION OF THE CURVE OF CURRENT / VOLTAGE ACCORDING TO THE TEMPERATURE OF THE CELL.

## POWER CURVE

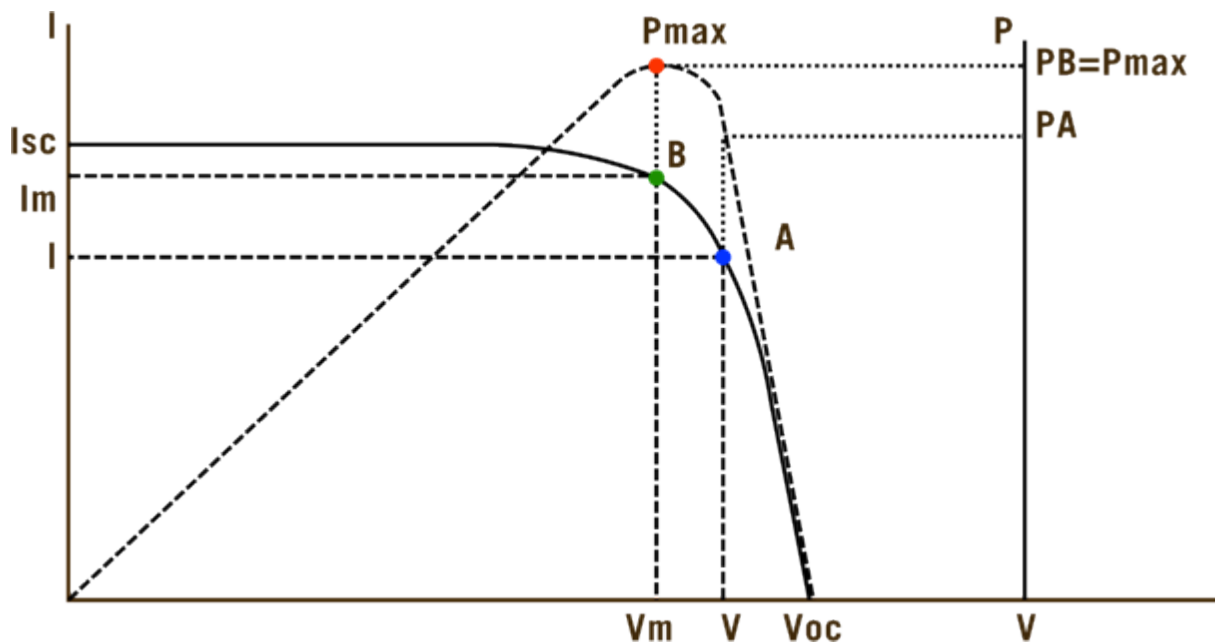


FIGURE 4. CURVE OF THE POWER PRODUCED BY A PHOTOVOLTAIC MODULE IN REFERENCE TO THE WORKING POINT.

THE ABOVE FIGURE SHOWS THAT THERE IS A POINT FOR WHICH THE PRODUCT  $I \times V$  REACHES ITS MAXIMUM. THIS POINT, CALLED THE MAXIMUM POWER POINT, DETERMINES THE PEAK POWER USING THE UNITS (Wp).

THE ABILITY OF THE SYSTEM TO TRACE THIS POINT IN RELATION TO THE WORKING CONDITIONS VARIATION IS CALLED, "TRACKING OF THE MAXIMUM POTENTIAL POINT (TPMP)".

## JUNCTION BOX

THE JUNCTION BOX CAN BE FOUND ON THE BACKSIDE OF THE MODULE. ALL THE CONNECTIONS IN IT ARE MADE FROM THE SOLDERING OF CELLS TO THE TERMINALS, LINKED THROUGH BY-PASS DIODES, AND THROUGH THE CIRCUIT BOARD TO +/- OUTPUTS TO THE CABLES WHICH HAVE (MULTI TYPE) CONNECTORS AT THEIR ENDS.

THE JUNCTION BOX DOES NOT REQUIRE ANY EXTRA FIELD WIRING AT THE TERMINALS. (CHANGING WIRES OR MODIFYING ANY PIECE OF THE JUNCTION BOX WILL VOID THE MODULE WARRANTY).

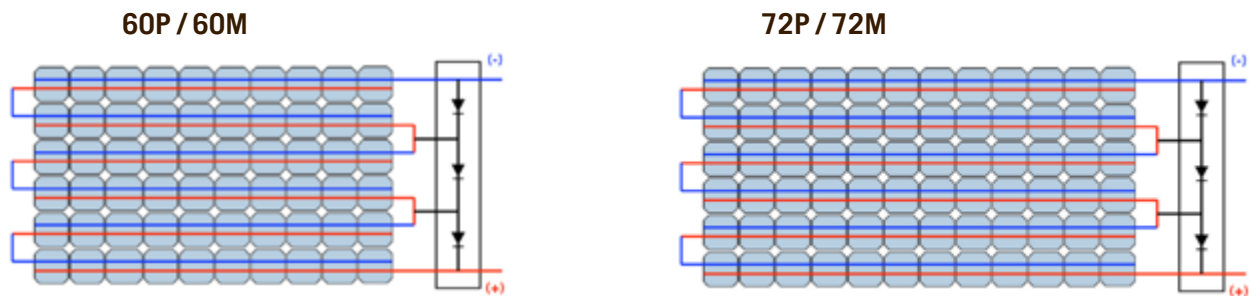


FIGURE 5. ELECTRICAL SCHEMATIC OF THE CONNECTION BETWEEN THE CELLS AND THE DIODES, THAT INTERACTS IN THE PHOTOVOLTAIC SOLAR MODULE.

THE JUNCTION BOX CONTAINS THREE BY-PASS DIODES TO AVOID REVERSE VOLTAGE DUE TO SHADOWING OF CELLS RESULTING FROM THE PROJECTION OF ANY OBJECT OR FROM THE ACCUMULATION OF DIRT OR DEBRIS.

THE REVERSE POLARIZATION OF A CELL CAN LEAD TO CONSUMPTION OF ENERGY PRODUCED BY THE REST OF THE SYSTEM. THE DISSIPATION OF THIS ENERGY CAN LEAD TO DANGEROUS OVERHEATING AND AFFECT THE CELL. DAMAGE CAN INCLUDE, BUT NOT BE LIMITED TO, THE RELEASE OF ITS ANTI-REFLECTION CAP, THE PERFORATION OF THE P-N JUNCTION OR EVEN THE BREAKAGE OF THE SOLDERING.

BY-PASS DIODES HAVE THE CAPACITY TO RUN A CURRENT GREATER THAN THE MAXIMUM PRODUCED BY THE MODULE AND BLOCK THE REVERSE CURRENT GENERATED BY THE SYSTEM ITSELF TO AVOID OVER-HEATING.

## DIODE CHARACTERISTICS

ALL MODULES, 60P, 60M, 72P & 72M, CONTAIN THREE BY-PASS DIODES EACH, WITH THE FOLLOWING CHARACTERISTICS:

MODEL TYPE	ULTRAFAST RECTIFIERS
MAXIMUM AVERAGE FORWARD CURRENT	@T <sub>c</sub> = 150°C: 15 A
MAXIMUM DC BLOCKING VOLTAGE	200 V
MAXIMUM INSTANTANEOUS REVERSE CURRENT	@T <sub>c</sub> = 25 °C: 10 µA
	@T <sub>c</sub> = 150 °C: 500 µA
BREAKDOWN REVERSE CURRENT	12 A

## **WARNINGS AND ELECTRICAL RISKS**

- **EACH MODULE PRODUCES A CONTINUOUS CURRENT (DC) WHEN EXPOSED TO SUNLIGHT OR OTHER LIGHT SOURCE.**
- **CONTACT WITH ANY OF THE ELECTRICALLY ACTIVE PARTS OF THE MODULE, SUCH AS TERMINALS, CAN RESULT IN INJURY OR DEATH, REGARDLESS WHETHER THE MODULE IS CONNECTED OR NOT.**
- **THE MODULES MUST BE HANDLED AND INSTALLED ONLY BY CERTIFIED ELECTRICIANS.**
- **THE MODULES ARE PACKED AND PROTECTED TO AVOID TRANSPORTATION AND HANDLING DAMAGE. PACKAGING MUST NOT BE REMOVED UNTIL THE MOMENT OF INSTALLATION TO AVOID DAMAGE.**
  - **THE MODULES SHOULD BE STORED IN A DRY AND TEMPERATURE CONTROLLED PLACE PRIOR TO THEIR INSTALLATION, ALWAYS IN A WELL-BALANCED POSITION. PLEASE NOTE THAT DROPPING CAN RESULT IN GLASS BREAKAGE. A MODULE WITH A BROKEN GLASS MUST NOT BE INSTALLED. BROKEN GLASS CAN PRODUCE FRAGMENTS THAT MAY CAUSE INJURY.**
  - **THE MODULE'S GLASS IS TEMPERED AND THEREFORE HAS HIGHER RESISTANCE TO IMPACT. HOWEVER, IMPACT OF A TOOL CAN CAUSE SERIOUS DAMAGE TO IT. MODULES SHOULD BE HANDLED WITH EXTREME CAUTION TO AVOID IMPACT FROM ANY TOOL OR OTHER HEAVY OBJECTS. WALKING ON THE MODULES SHOULD ALSO BE AVOIDED. MAXIMUM LOAD RATING IS 146.5 Kg/m<sup>2</sup> (30 LB/ FT<sup>2</sup>).**
  - **DO NOT DISASSEMBLE THE MODULE OR REMOVE ANY OF ITS PARTS. IMPROPER HANDLING OF THE JUNCTION BOX MAY PRODUCE LOSS OF THE WATERPROOF RATING AND ELECTRICAL PROTECTION, WHICH MAY LEAD TO DETERIORATION AND/OR CORROSION OF THE UNIT. DO NOT HANDLE THE BYPASS DIODES OR THEIR CONNECTIONS EITHER.**
  - **THE MODULE ALREADY CONTAINS ALL THE NECESSARY WIRING FOR ITS CONNECTION, SO THE JUNCTION BOX MUST NOT BE INTERFERED WITH DURING ITS INSTALLATION.**
  - **THE PHOTOVOLTAIC SOLAR MODULE HAS BEEN DESIGNED TO WORK WITH LEVELS OF INCIDENTAL SOLAR RADIATION NORMALLY FOUND ON THE EARTH'S SURFACE. DO NOT CONCENTRATE THE RADIATION WITHOUT THE EXPRESS CONSENT OF AUTHORIZED PERSONNEL. THIS CONCENTRATION CAN PRODUCE MALFUNCTIONS AND CAN DAMAGE CELLS.**
  - **THE PHOTOVOLTAIC MODULE PRODUCES A VOLTAGE IN THE FORM OF CURRENT THAT ALWAYS CONTINUES AS LONG AS THE UNIT IS ILLUMINATED. AS A PRECAUTION, IT IS RECOMMENDED THAT THE MODULE SHOULD BE COVERED FOR ITS HANDLING AND/OR CONNECTION OR OTHERWISE THE CONNECTION SHOULD BE DONE IN HOURS OF LOW INTENSITY OF IRRADIANCE.**
  - **THE TOOLS USED TO CONNECT THE MODULES MUST COMPLY WITH ALL APPLICABLE ELECTRICAL SAFETY REGULATIONS. THEY MUST BE DRY AND HAVE THE CORRECT LEVEL OF INSULATION.**
  - **THE CONNECTION AND DISCONNECTION OF THE PHOTOVOLTAIC MODULES CAN PRODUCE SPARKS. DO NOT ATTEMPT TO CONNECT OR DISCONNECT THE MODULES IN THE PRESENCE OF FLAMMABLE SUBSTANCES.**
  - **EACH MODULE STRING MUST HAVE ADEQUATE PROTECTION AGAINST EXCESSES OF CURRENT USING FAST ACTING FUSES AND AGAINST EXCESSES OF VOLTAGE USING VARIABLE RESISTORS.**
  - **UNDER NORMAL CONDITIONS, A PHOTOVOLTAIC MODULE IS LIKELY TO EXPERIENCE CONDITIONS THAT PRODUCE MORE CURRENT AND/OR VOLTAGE THAN REPORTED AT STANDARD TEST CONDITIONS. ACCORDINGLY, THE VALUES OF ISC AND VOC MARKED ON THIS MODULE SHOULD BE MULTIPLIED BY A FACTOR OF 1.25 WHEN DETERMINING COMPONENT VOLTAGE RATINGS, CONDUCTOR CAPACITIES, FUSE SIZES, AND SIZE OF CONTROLS CONNECTED TO THE PV OUTPUT. PLEASE REFER TO THE ALL APPLICABLE ELECTRICAL SAFETY CODE FOR ADDITIONAL INFORMATION.**

## CONNECTION LIMIT OF THE MODULES

ACCORDING TO THE C-UL REGULATION AND CONSIDERING THE THICKNESS AND COMPOSITION OF HELENE'S MODULES BACK SHEETS THAT PROVIDE ELECTRICAL INSULATION OF 600 Vdc. THE MODULES CAN BE CONNECTED TO EACH OTHER IN GROUPS OF UP TO 11 FOR 275U/300M AND 13 FOR 60P / 60M.

DESPITE THE PREVIOUS STATEMENT, THE CURRENT LIMIT OF THE CONNECTION OF THE MODULES IS DEFINED BY THE VOLTAGE THAT CAN ENTER TO THE INVERTERS UNDER NORMAL OPERATION, WHICH TENDS TO BE AROUND 500 Vdc. THIS VALUE WOULD LIMIT THE NUMBER OF MODULES THAT CAN BE CONNECTED IN SERIES TO 9 FOR 275U/300M & 11 FOR 60P / HEEU215M (CALCULATED TO AN EXTERNAL TEMPERATURE OF -40°C).

HOWEVER, THERE IS NO LIMIT AS TO THE CONNECTION OF MODULES IN PARALLEL, AS THE OPERATION OF ONE DOES NOT AFFECT THE OTHERS, EXCEPT FOR THE LIMITATION THAT THEY MUST ALL WORK AT THE SAME VOLTAGE LEVEL. THEREFORE, ALL THE MODULES CONNECTED IN PARALLEL MUST HAVE AN EQUAL NUMBER OF CELLS, IN THIS WAY AVOIDING THE RECIRCULATION OF CURRENT BETWEEN ROWS OF MODULES.

IN CASE OF A PARALLEL CONNECTION, THE NEW MAXIMUM CURRENT ALLOWABLE TO THE INVERTER IS THE LIMIT OF THE NUMBER OF MODULES TO BE INSTALLED.

## MODULE WIRINGS

- THE WIRING MUST ENSURE THAT THE LOSS OF NOMINAL VOLTAGE IS LESS THAN 2 %; IT IS RECOMMENDED TO MAINTAIN THIS LOSS AROUND 1 % OF THE NOMINAL POWER.
- THE RECOMMENDED RATING FOR WIRING CONNECTIONS IS 6MM<sup>2</sup> AND NEVER LESS THAN 4MM<sup>2</sup> , (10 AWG RECOMMENDED AND NEVER LESS THAN 12 AWG). USE ONLY CABLE LISTED BY UL 4703 PV WIRE, 90°C THERMAL INSULATED IN ACCORDANCE WITH LOCAL FIRE, BUILDING AND ELECTRICAL CODES.

## RECOMMENDATIONS FOR THE INSTALLATION

THE MODULES MUST BE SECURED TO STRUCTURES THAT SUPPORT THEM USING ANCHORS THAT TAKE INTO ACCOUNT THE CONSTRAINTS IMPOSED BY THE RESULTING MOVEMENTS OF THE PROCESSES OF THERMAL EXPANSION AND CONTRACTION.

TO ACHIEVE THE MAXIMUM ANNUAL YIELD, THE INSTALLER SHALL DETERMINE THE OPTIMUM ORIENTATION AND TILT OF THE PV MODULES. GENERATION OF MAXIMUM POWER OCCURS WHEN SUNLIGHT SHINES PERPENDICULARLY ONTO THE FRONT SURFACE PV MODULES.

### SHADING

EVEN THE SLIGHTEST PARTIAL SHADING (I.E. FROM DIRT DEPOSITS) WILL CAUSE A REDUCTION IN YIELD. A MODULE IS CONSIDERED "SHADOW-FREE" IF IT IS UNOBSTRUCTED ACROSS ITS ENTIRE SURFACE REGARDLESS THE TIME OF THE YEAR. EVEN ON THE SHORTEST DAY OF THE YEAR, UNOBSTRUCTED SUNLIGHT SHOULD REACH THE MODULE FRONT SURFACE.

### VENTILATION

SUFFICIENT CLEARANCE BETWEEN THE MODULE FRAME AND THE MOUNTING SURFACE IS REQUIRED TO ALLOW COOLING AIR TO CIRCULATE AROUND THE BACK OF THE MODULE. THE CLEARANCE SHOULD ALSO ALLOW ANY RESULTING CONDENSATION OR MOISTURE TO DISSIPATE. THE SOLAR MODULE SHOULD BE ASSEMBLED IN THE BEST POSSIBLE ORIENTATION (SOUTH IN THE NORTH HEMISPHERE, NORTH IN THE SOUTH HEMISPHERE) AND KEPT FREE FROM SHADOWS, INCLUDING PARTIAL SHADOWS, TO BE ABLE TO OBTAIN A GOOD PERFORMANCE. CALCULATE THE BEST INCLINATION OF THE SYSTEM DEPENDING ON THE LATITUDE; TO ACHIEVE A GOOD SELF-CLEANING EFFECT THROUGH PRECIPITATION, THE TILT OF THE MODULES SHOULD BE AT LEAST 20°.

- EACH MODULE SHOULD BE SITUATED WITH AT LEAST 15 CENTIMETRES (6 INCHES) OF OPEN SPACE BEHIND IT TO ENSURE THAT THE VENTILATION DISSIPATES THE HEAT PRODUCED BY THE CELLS, AND THAT THE LOSSES FROM THIS EFFECT ARE MINIMAL.
- IF THE MODULES ARE INSTALLED ONE BESIDE THE OTHER, THE HEIGHT OF THE HARDWARE SHOULD BE LEVELLED TO AVOID THE PROJECTION OF SHADOWS.
- THE ANCHORS THAT CONNECT THE MODULE FRAME TO THE STRUCTURE AND THE STRUCTURE TO THE BUILDING MUST COMPLY WITH THE STANDARDS FOR WIND RESISTANCE OUTLINED BY THE LOCAL BUILDING CODE.
- PRIOR TO THE INSTALLATION OF MODULES, CONTACT THE APPROPRIATE AUTHORITIES TO DETERMINE INSTALLATION PERMITS AND INSPECTIONS.
- CHECK APPLICABLE BUILDING CODES TO ENSURE THAT THE CONSTRUCTION OR STRUCTURE (ROOF, FACADE, SUPPORT, ETC.) WHERE THE MODULES ARE BEING INSTALLED HAS APPROPRIATE STRENGTH.
- WHEN INSTALLING THE MODULES, PLEASE ENSURE THE ASSEMBLY IS MOUNTED OVER A FIRE RESISTANT ROOF COVERING RATED FOR THE APPLICATION AND REQUIRED A SLOPE LESS THAN 5in/ft (127 mm/305 mm) TO MAINTAIN A FIRE CLASS RATING.
- THE MODULES MUST NOT BE INSTALLED IN THE PROXIMITY OF HIGHLY FLAMMABLE SUBSTANCES (I.E. FILLING STATIONS, GAS CONTAINERS, PAINT EQUIPMENT) SINCE THE CONNECTION AND DISCONNECTION PROCESS MAY PRODUCE SPARKS.
- THE MODULES MUST NOT BE INSTALLED NEAR OPEN FLAMES OR FLAMMABLE MATERIALS.
- DO NOT EXPOSE MODULES TO ARTIFICIALLY CONCENTRATED LIGHT SOURCES.
- THE MODULES MUST NOT BE IMMERSSED OR CONTINUOUSLY EXPOSED TO WATER
- THERE IS A RISK OF CORROSION WHEN MODULES ARE EXPOSED TO SALT (I.E., MARINE ENVIRONMENTS) OR SULPHUR (I.E., SULPHUR SOURCES, VOLCANOES).

## INSTALLATION REQUIREMENTS

- ENSURE THAT THE MODULES MEET TECHNICAL REQUIREMENTS OF THE PV SYSTEM AS DESIGNED.
- ENSURE THAT OTHER SYSTEM COMPONENTS DO NOT EXERT DAMAGING MECHANICAL OR ELECTRICAL INFLUENCE ON THE MODULES.
- MODULES CAN BE WIRED IN SERIES TO INCREASE VOLTAGE OR IN PARALLEL TO INCREASE CURRENT. TO CONNECT IN SERIES, CONNECT CABLES FROM THE POSITIVE TERMINAL OF ONE MODULE TO THE NEGATIVE TERMINAL OF THE FOLLOWING ONE. TO CONNECT IN PARALLEL, CONNECT CABLES FROM THE POSITIVE TERMINAL OF ONE MODULE TO THE POSITIVE TERMINAL ON THE FOLLOWING.
- CONNECT THE QUANTITY OF MODULES THAT MATCH THE VOLTAGE SPECIFICATIONS OF THE INVERTERS USED IN THE SYSTEM. THE MODULES MUST NOT BE CONNECTED TOGETHER TO CREATE A VOLTAGE HIGHER THAN THE PERMITTED SYSTEM VOLTAGE.
- IN ORDER TO AVOID (OR MINIMIZE) MISMATCH EFFECTS IN ARRAYS, IT IS RECOMMENDED THAT IDENTICAL ELECTRICAL PERFORMANCE OF MODULES SHOULD BE CONNECTED WITHIN THE SAME SERIES.
- MODULES SHOULD BE FIRMLY FIXED IN PLACE IN A MANNER SUITABLE TO WITHSTAND ALL EXPECTED LOADS, INCLUDING WIND AND SNOW LOADS.
- THE SMALL OPENINGS ON THE UNDERSIDE OF THE MODULES ALLOW RAIN TO RUN OUT. MAKE SURE THAT THESE OPENINGS ARE NOT OBSTRUCTED AFTER MOUNTING.

## GROUNDING

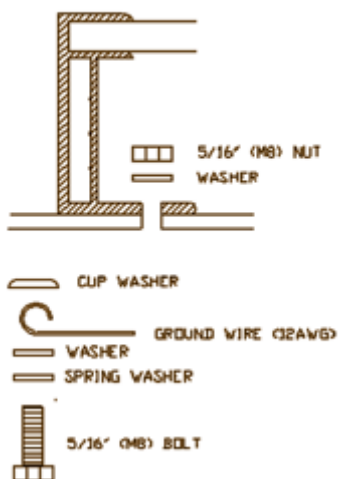
THE MODULES ARE CERTIFIED DOUBLE INSULATED, HOWEVER IT IS RECOMMENDED THAT THEY BE GROUNDED. IN U.S. AND CANADA: ALL PV MODULES MUST BE GROUNDED BY ELECTRICAL CONNECTION FROM THE MODULE FRAMES TO THE GROUND. A UL-LISTED GROUNDING LUG SHOULD BE USED.

ENSURE COMPLIANCE WITH ALL LOCAL ELECTRICAL CODES AND REGULATIONS.

SEVERAL DIFFERENT METHODS OF GROUNDING CAN BE USED TO PROVIDE THE REQUIRED CONNECTION THROUGH THE ANODIZED FRAME; THE FOLLOWING METHODS OF PERFORMING THIS TASK ARE ACCEPTABLE.

A UL-LISTED GROUNDING LUG MAY BE USED. THE EXISTING GROUNDING HOLES IN THE MODULE FRAMES SHOULD BE USED AS THE POINT OF ATTACHMENT TO THE MODULE FRAME, THE 9MM (0.354") DIAMETER GROUNDING HOLES (IDENTIFIED WITH YELLOW GROUNDING LABEL) ACCEPT M8 -5/16" BOLTS ONTO THE MODULE FRAME. TO ENSURE A CONDUCTIVE CONNECTION, I.E. TO PENETRATE THE NON-CONDUCTIVE COATING ON THE FRAME, A COMBINATION OF SCREW, SPRING WASHER AND LOCK NUT MUST BE USED TO MOUNT THE GROUNDING LUG ONTO THE FRAME. THE SPRING WASHER MUST BE PLACED BETWEEN THE FRAME AND THE GROUNDING LUG. USE ALL STAINLESS STEEL HARDWARE TO MOUNT THE LUG TO THE MODULE FRAME.

*Ground using a bolt and nut and wire*



THE GROUNDING LUG HAS TO BE CAPABLE OF ACCEPTING A 4-14 AWG COPPER CONDUCTOR. MODULES CAN BE GROUNDED USING CLIP SYSTEMS PROVIDED THEY HAVE BEEN TESTED AND CERTIFIED TO LOCAL REGULATION ON ANODIZED ALUMINUM FRAME AND ARE INSTALLED ACCORDING TO THE MANUFACTURE'S SPECIFIED INSTRUCTIONS.

CONNECT MODULE FRAMES TO EACH OTHER USING CABLES WITH CABLE LUGS. ALL THE CONNECTIONS ON THE CONDUCTIVE CONNECTION MUST BE FIXED. METAL CONTAINING IRON IN THE CONDUCTIVE CONNECTION SHOULD BE TREATED AGAINST CORROSION BY ANODIZATION, SPRAY-PAINTING, OR GALVANIZATION TO PREVENT RUSTING AND CORROSION. ANOTHER METHOD IS TO GROUND THE FRAME OF THE MODULE TO RACKING STRUCTURE IN ACCORDANCE WITH NEC REQUIREMENTS FOR GROUNDING SOLAR ELECTRICAL SYSTEMS.

ALTERNATIVELY A SELF TAPPING SCREW (10X3/4 SIZE) CAN BE USED TO ATTACH A WIRE TERMINAL LOOP TO A 4MM DRAINAGE HOLE. AS WELL, GROUNDING CONNECTIONS USING SPIKES INTO THE SURFACE AT CLAMPING POINT (I.E. WEEB) WHICH ARE UL APPROVED ARE ALSO ALLOWED.





## INSTALLATION INSTRUCTIONS

**MODULES SHOULD BE BOLTED TO SUPPORT STRUCTURES THROUGH MOUNTING HOLES LOCATED IN THE FRAME'S BACK FLANGES ONLY; DO NOT DRILL ADDITIONAL HOLES, DOING SO WILL VOID THE WARRANTY. EACH MODULE MUST BE SECURELY FASTENED AT A MINIMUM OF 4 POINTS.**

**CLAMPING OR BOLTING CAN BE DONE WITH A MINIMUM OF 4 CLAMPS ON THE FRAME OF EACH MODULE, WITH EITHER 2 ON EACH SHORT FRAME, OR 2 ON EACH LONG FRAME.**

**CLAMPING OR BOLTING CAN BE DONE WITH A MINIMUM OF 4 CLAMPS/BOLTS ON THE FRAME OF EACH MODULE, WITH 2 ON EACH SHORT FRAME, OR 2 ON EACH LONG FRAME. WHEN CLAMPING, THE FOLLOWING CRITERIA IS MET:**

- 1. THE CLAMPS CENTER MUST BE NO CLOSER TO MODULE CENTER THAN THE MOUNTING BOLT CENTER.**
- 2. THE CLAMPS MUST HAVE A MINIMUM 5MM OVERLAP OF CLAMP ONTO TOP SURFACE FROM THE SIDE, AND NO MORE THAN 6MM OVERLAP. IF THE CLAMPS ARE BEING USED TO SUPPORT TWO MODULES (AT CORNER OF EACH), IT MUST HAVE A MINIMUM OF 25MM ON EACH MODULE FRAME SURFACE, AND BE A MINIMUM OF 57MM.**
- 3. IF CLAMPS ARE SUPPORTING A SINGLE MODULE, THERE MUST BE A MINIMUM LENGTH OF 25MM OF CLAMPED SURFACE PER MODULE.**

**ENSURE TO COMPLY WITH ALL LOCAL BUILDING CODES.**

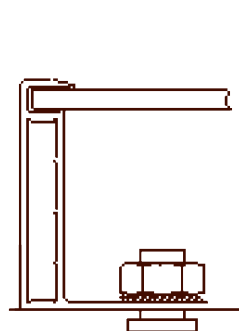
**HELIENE MODULES COULD BE MOUNTED ON A ROOF: FREESTANDING MODULES TURN A CLASS B ROOFTOP INTO A CLASS C ROOFTOP.**

**USE APPROPRIATE CORROSION-PROOF FASTENING MATERIALS.**

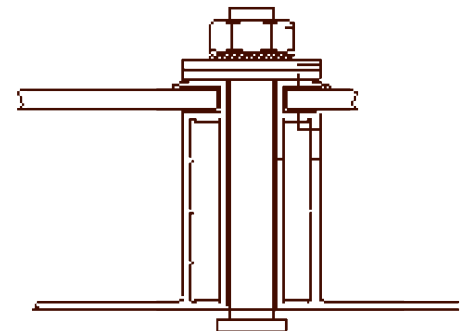
**TOP OR BOTTOM CLAMPING METHODS WILL VARY AND ARE DEPENDENT ON THE MOUNTING STRUCTURES. FOLLOW MOUNTING GUIDELINES RECOMMENDED BY THE PV RACKING SUPPLIER.**

**THE MOUNTING DESIGN MUST BE CERTIFIED IN THE USA AND CANADA BY A REGISTERED PROFESSIONAL ENGINEER. THE MOUNTING DESIGN AND PROCEDURES SHALL COMPLY WITH LOCAL CODES AND ALL AUTHORITIES HAVING JURISDICTION.**

**USE A TORQUE WRENCH FOR INSTALLATION (TORQUE TO AMOUNT SPECIFIED BY PROFESSIONAL ENGINEER). THE FIGURE BELOW SHOWS TWO METHODS OF FASTENING A MODULE TO A SUPPORT STRUCTURE.**



**BOLTING**



**CLAMPING ON**

## TRANSPORT, STORAGE, UNPACKING AND IDENTIFICATION

ALWAYS HANDLE THE BOXES OF MODULES AND MODULES THEMSELVES WITH EXTREME CARE. WE RECOMMEND THAT THE MODULES BE STORED INDOORS, IN THE HELIENE INC. SHIPPING PACKAGING STRAPPED TO PALLETS UNTIL THEY REACH THE DESTINATION OF INSTALLATION.

### STORAGE OF PALLETS OF MODULES

STORE PALLETS OF MODULES ON A LEVELLED SURFACE, IN A DRY AND VENTILATED ROOM.

PALLETS ARE NOT WEATHERPROOF AND MODULES ARE NOT MEANT TO BE EXPOSED TO WEATHER ELEMENTS UNTIL COMPLETELY UNPACKAGED.

STORE MODULES WHERE THERE IS NOT ANY POTENTIAL FOR FALLING OBJECT ONTO MODULES

STACK ONLY 2 BOXES/PALLETS HIGH AT MAXIMUM, AND NEVER ANY OTHER MATERIALS ON TOP OF THEM.



### TRANSPORTATION OF PALLETS OF MODULES

DO NOT TRANSPORT MODULES IN AN UPRIGHT POSITION, ONLY TRANSPORT THEM IN BOX STRAPPED TO PALLET AS SUPPLIED BY HELIENE INC. ON A LEVEL SURFACE.

STACK ONLY 2 BOXES/PALLETS HIGH AT MAXIMUM, AND NEVER PLACE OTHER MATERIAL ON TOP OF THEM.

LOAD AND UNLOAD WITH A FORKLIFT AVOIDING HITTING, BANGING, DROPPING OR DAMAGE TO THE BOXES.

### UNPACKING & HANDLING OF MODULES

BEFORE UNPACKING, HAVE MODULE BOX IN A LEVEL, DRY AREA, FREE OF EXCESSIVE DUST, DEBRIS

CUT STRAPS FROM BOX.

REMAINDER OF PROCESS REQUIRES TWO PEOPLE. TOGETHER, REMOVE BOX TOP VERTICALLY, LIFTING OVER TOP OF THE MODULES.

CUT PLASTIC WRAP FROM SURROUNDING MODULES, TAKING CARE NOT SCRATCH FRAME OR GLASS.

CARRY MODULES BY THE FRAME WITH TWO HAND EACH, 1 PERSON LIFTING ON OPPOSITE ENDS.

NEVER LIFT BY JUNCTION BOX WIRES OR BOX, OR BY LIFTING ON GLASS OR BACK-SHEET SURFACE

DO NOT LEAVE A MODULE UNSUPPORTED OR UNSECURED.

KEEP ELECTRICAL CONTACTS CLEAN AND DRY.

DO NOT STAND, STEP ON, WALK OR JUMP ON THE MODULES.

**OBSERVE FRONT & BACK OF EACH MODULE. DAMAGE TO THE FRONT OR REAR SURFACE GLASS / INSULATION FILM CAN HAVE SERIOUS CONSEQUENCES (DE-LAMINATION, DANGER TO LIFE AND HEALTH). DO NOT INSTALL OR OPERATE A MODULE WITH DAMAGED REAR SURFACE INSULATION FILM. CONTACT SUPPLIER FOR ACTIONS TO BE TAKEN.**

**DO NOT SET THE MODULES ONTO SURFACES SMALLER THAN THE MODULE PERIMETER SIZE, AS MODULE WEIGHT MUST SIT ON THE ALUMINUM FRAME ONLY.**

## IDENTIFICATION

**EACH MODULE IS IDENTIFIED IN 3 LOCATIONS. 2 SERIAL NUMBERS WITH ITS RESPECTIVE BAR CODES, ONE ON THE SHORT FRAME SIDE, AND ONE ON THE INSIDE OF THE JUNCTION BOX. THE THIRD IDENTIFICATION IS THE NAMEPLATE LABEL WITH MODEL TYPE, ELECTRICAL CHARACTERISTICS, DATA OR MANUFACTURE AND SERIAL NUMBER & BAR CODE. WITHIN THE PACKING SLIP WILL ALSO BE FOUND DETAILED RESULTS FROM THE MODULES FLASH TEST.**



## **MAINTENANCE**

- **CLEANING OF THE MODULES IMPROVES THE OPTICAL PERFORMANCE.** THE CLEANING SHOULD ALWAYS BE DONE USING CLEAN WATER WITH LOW CALCIUM CONCENTRATION AND WITHOUT DETERGENTS OR ABRASIVES. THE WATER SHOULD NOT BE APPLIED AT HIGH PRESSURE AND SCRAPERS OR OTHER CLEANING TOOLS SHOULD NOT BE USED AS THEY MAY CAUSE SCRATCHES ON THE GLASS. AVOID PRODUCING A THERMAL SHOCK USING COLD WATER WHEN GLASS COULD BE AT A VERY HIGH TEMPERATURE (E.I. AT NOON).
- **VISUAL INSPECTION OF THE MODULE.** A THOROUGH VISUAL INSPECTION OF THE MODULES SHOULD BE CONDUCTED ONCE OR TWICE A YEAR, NOTING POSSIBLE EFFECTS OF AGING OR CORROSION. IN THIS INSPECTION, SPECIAL ATTENTION SHOULD BE GIVEN TO THE INTEGRITY OF THE GLASS, THE ALUMINUM FRAME, THE SILICONE SEALS, THE WATERPROOF OF THE JUNCTION BOX, OXIDATION OF THE CONTACTS BETWEEN CELLS AND CONDENSATION IN THE INTERIOR OF THE LAMINATE. THESE TASKS SHOULD BE DONE AT LEAST ONCE A YEAR BY QUALIFIED PERSONNEL.
- **TESTING OF THE WIRING AND THE CONNECTIONS.** AT LEAST ONCE A YEAR, THE INTEGRITY AND WATERPROOF OF ALL OF THE PARTS THAT MAKE UP THE WIRING AND CONNECTIONS OF THE SOLAR INSTALLATION SHOULD BE TESTED: JUNCTION BOXES, ISOLATION OF OUTDOOR CABLES, PROTECTIVE TUBING, CONNECTION LINKS OF CONNECTORS, SUPPORT CABLES, FUSE BOXES, ETC. THIS WORK, ALONG WITH THE MEASURING OF ISOLATION DISTANCES AND RESISTANCE OF THE INSTALLATION TO THE GROUND SHOULD BE DONE BY QUALIFIED PERSONNEL DULY TRAINED AND EQUIPPED FOR THE JOB.

## **DIAGNOSTICS AND TROUBLESHOOTING**

THE STRICT QUALITY CONTROLS IN THE FACTORY ENSURE THAT **HELIENE** MODULES ARE SOLD FREE OF DEFECTS, BREAKAGES AND/OR OTHERS PROBLEMS. HOWEVER, IN ITS OPERATION SOME PROBLEMS MAY ARISE THAT CAN ALTER THE CORRECT OPERATION OF THE MODULES. THESE ARE DETAILED AS FOLLOWS:

**BREAKING OF THE GLASS.** THE TEMPERED GLASS THAT IS PART OF THE MODULES IS RESISTANT TO IMPACT, HOWEVER POOR HANDLING DURING TRANSPORT, OR INSTALLATION WITH EXCESSIVE MECHANICAL TENSION IN THE RACKING STRUCTURE, OR IMPACT CAN BREAK THE GLASS. CHIPPING OF THE SURFACE MIGHT REDUCE THE TRANSPARENCY OF THE MODULE. ACCUMULATION OF DIRT AND HUMIDITY BETWEEN THE SPOTS MIGHT LEAD TO FREEZING, INCREASING THE SEPARATION OF THE FRAME.

**LOSS OF SEAL OF THE JUNCTION BOX:** A LOSS OF THE JUNCTION BOX SEAL WILL ALLOW HUMIDITY IN, POSSIBLE CAUSING CORROSION AND A BAD ELECTRICAL FUNCTIONING.

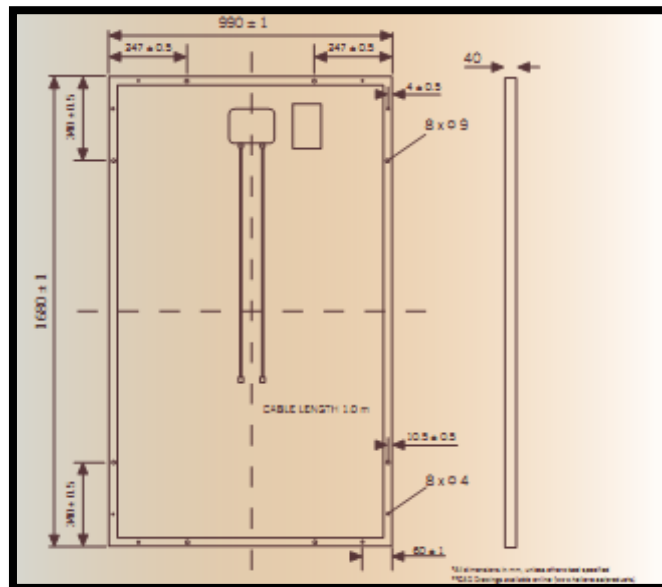
**SHORT-CIRCUIT OF THE MODULE:** AN EXCESS OF INTENSITY DUE TO METEOROLOGICAL PHENOMENA OR MISTAKES IN THE CONNECTION CAN CAUSE DAMAGE, OR SHORT-CIRCUIT OF THE BYPASS DIODES CONTAINED IN THE MODULE. AS A RESULT, THE VOLTAGE OF THE MODULE WILL DECLINE IN PROPORTION TO THE DAMAGED DIODES TO 2/3, 1/3, OR 0 V. IN THIS CASE, THE BYPASS DIODES MUST BE SUBSTITUTED ONLY BY **HELIENE** PERSONNEL.

**HELIENE** GUARANTEES ITS MODULES FOR TEN YEARS. IN THE EVENT OF ACCELERATED DETERIORATION OF THE MODULE, **HELIENE** SHOULD BE NOTIFIED IMMEDIATELY TO MAKE THE NECESSARY REPLACEMENT.

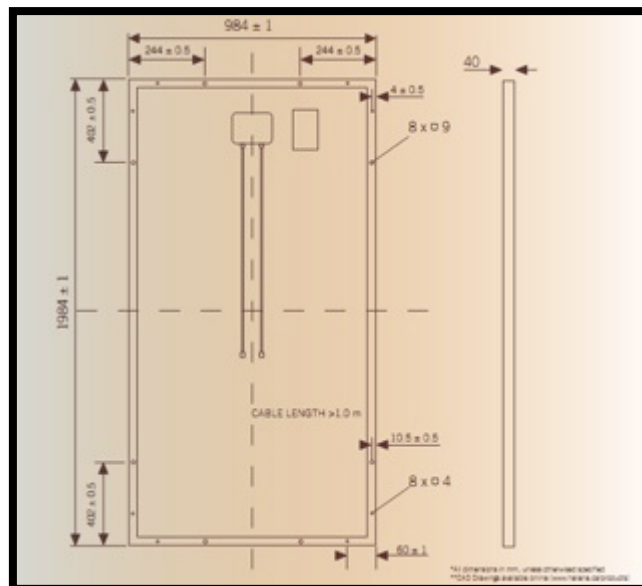
## MODULE VIEWS WITH DIMENSIONS

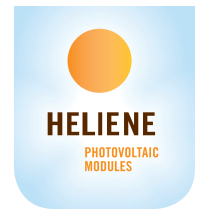
HELIENE MODULES ARE ASSEMBLED WITH THE SAME TYPE GLASS AND ALUMINUM FRAME. THEREFORE, THEY SHARE, THE SAME DIMENSIONS FOR PAIRINGS OF 60P/60M & 72P/72M:

### 60P / 60M



### 72P / 72M





## **CERTIFICATES**

**CERTIFICATE HELIENE CE**

**CERTIFICATE OF HELIENE GUARANTEE**

**FACTORY CERTIFICATE TÜV NORD/INTERTEK**

**MONO-CRYSTALLINE MODULES IEC 61625, IEC 61730 TÜV NORD CERTIFICATE**

**MULTI-CRYSTALLINE MODULES IEC 61625, IEC 61730 TÜV NORD CERTIFICATE**

**CERTIFICATE ULC/ORD-C1703-01 BY INTERTEK**

**cETL<sub>US</sub> MARK WITH LISTED NUMBERS BADALONA, SPAIN 4001272, SAULT STE. MARIE, CANADA 4002316,**

**CEC LISTED**

**FOR TECHNICAL ASSISTANCE PLEASE CONTACT OUR QUALITY/TECHNICAL TEAM AT 705.575.6556**